U.S. DEPARTMENT OF ENERGY | Nuclear Energy

Nuclear Energy University Programs (NEUP) Fiscal Year 2015 Planning Webinar

Electrochemical Processing R&D Opportunities

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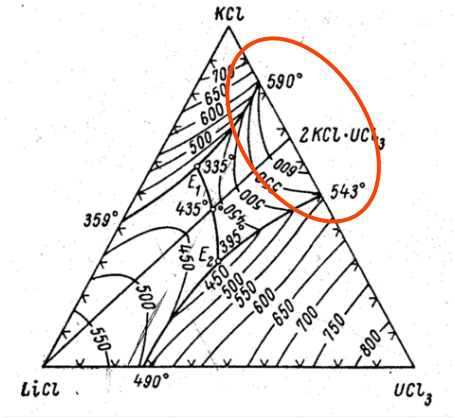
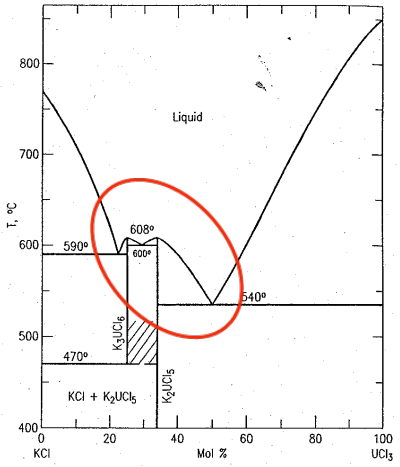
Electrochemical Processing Research Needs – Phase Equilibria Data

Deduce phase equilibria in binary and higher order molten salt systems that contain actinide and lanthanide halides

- Provide insight into solvent–solute interactions and thermodynamic properties of the systems
- Explore existence of compound formation; identify decomposition mechanisms and temperatures
- Fundamental chemical properties of molten salt systems



Obtain new data or help resolve existing conflicting results in the literature



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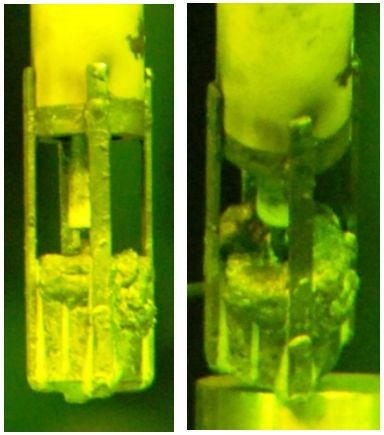
Electrochemical Processing Research Needs – Thermodynamic Properties

Determine thermodynamic properties of transuranic elements in molten salt systems to facilitate/enhance predictive model and separation process developments

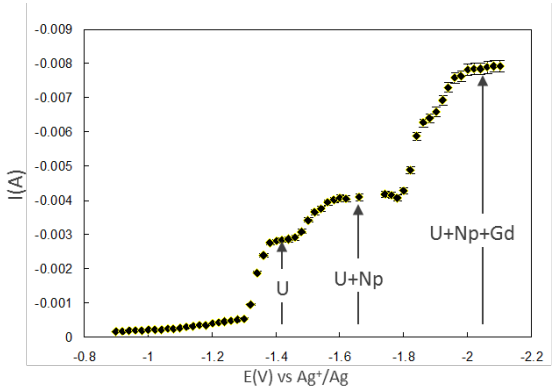
- Properties of interest include electrochemical potentials, activity and activity coefficients of transuranic halides in molten salts
- Range of experimental conditions of interests

  Transuranic element concentrations up to fifteen weight percent

  T = 500-650°C



Example product from U–Pu co-deposition study



Potential step measurement used to collect data for steady-state voltammogram

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Electrochemical Processing Research Needs – Innovative Processes

Develop novel, alternative molten salt-based separation methods which may lead to:

- **Significantly reducing the process complexity**
- **Potential cost reduction**
- **Reducing proliferation risk**
- **Minimize waste generation**

Examples:

- Actinide recovery from used fuel
- Actinide removal from molten salt waste streams
- Fission product recovery from the molten salt solvent thus allowing salt recycle